Remarks

Reconsideration of the subject application as amended herein is respectfully requested.

The Examiner has rejected the claims as being anticipated by or obvious in view of the Hochmair patent, the Hochmair publication and/or the Kuzma patent. The Applicant respectfully traverses these rejections.

As disclosed in the specification and in Fig. 2, the aural receptors along the inner wall of the cochlea are positioned so that they are spaced at a distance that gradually diminishes as the receptors approach the center of the cochlea. The present invention provides an electrode array with electrodes that are spaced along the area in a similar pattern. As discussed in the last paragraph of page 2 in the specification, one aspect of the invention is that the electrodes define an electrode density that is higher at predetermined locations along the cochlea. For example, the electrode density is higher at a specific neural region corresponding to a frequency band that is important for speech recognition.

The Kuzma reference discloses an alternative electrode array with most of the electrodes disposed at equal distances from each other along the length of the array. In particular, the paragraph at column 8 lines 34-42 makes it clear that the electrodes 17, 18 and 19 which are the only non-equally spaced electrodes in relation to the rest of the array, are not in fact electrodes at all, but are referred to as "dummy reference

contacts". These contacts are not connected to any wires, and merely provide a reference marker to the surgeon as to the depth of insertion of the array. Hence the orientation and spacing of these contacts in terms of the present invention relating to stimulating electrodes is irrelevant.

The Examiner is basing his rejection on a passage at column 10, lines 13-15, that has been taken significantly out of context. With reference to Fig 5, it is quite clear that the spacing between successive electrodes is intended to be equal, and as such this passage is nothing more than a statement of suitable spacings.

Having an appreciation of the size of the contacts and the array and the significant skill and dexterity required to manufacture such a device, the statement relating to the spacing between the corresponding points of adjacent electrode contact areas having a nominal value of "approximately 0.9mm + or - 0.1mm" merely represents this aspect. That is, this statement defines the spacing distance and an acceptable tolerance and is certainly NOT a statement that the electrode spacing should be between 0.8mm and 1.0mm. This portion of the disclosure actually further highlights the difference between the present invention and Kuzma, by disclosing substantially uniformly spaced electrodes and providing an indication of the value for that spacing. This interpretation is further supported by the description relating to the preferred manufacturing method, as discussed on column 12, lines 26-41. As is clearly evident in Fig. 7a, the electrodes 200 are welded onto the carrier 100, which provides

clear directions that the electrodes are intended to have uniform spacings, as it is the purpose of the specific construction process to improve ease of manufacture and to standardize the manufacturing process, wherein having non-equidistant electrodes actually complicates the manufacturing process. Clearly this citation should now be shown to have no relevance whatsoever to the present invention.

With regard to the cited Hochmair - Desoyer IEEE reference relied upon by the Examiner, this paper is a very early paper in the history of cochlear implant design, at a time when a commercial product was merely being contemplated. The reference as a whole provides a general discussion of the design characteristics and considerations for scala tympani electrode arrays.

In the passage relied upon by the Examiner in paragraph 5, page 45 namely, "Therefore, about 10-30 channels spaced between about 0.5-2mm, and covering the cochlear partition from approximately 10-25mm from the stapes, would be necessary", there is stated the general requirement for designing a cochlear electrode array. It merely suggests that it would be appropriate to design an electrode array covering between 10 and 30 channels. However, this portion fails to provide any direction of how many electrodes should be spaced in the array. It also states that the electrodes should be spaced apart and that the spacing could be 0.5-2mm, however this is in no way a suggestion that the spacing should be variable, it is merely a suggestion of an appropriate spacing, and hence one skilled in the art would assume that the electrodes

should be spaced equally. Further, the specific electrode array design described on pages 45-46 refers to a particular design having 16 ball electrodes arranged into two rows of eight, thereby forming an eight-channel array with bipolar stimulation occurring between the pair of electrodes in each row. It would seem that the Examiner is basing his rejection on the statement made in the last paragraph on page 46 which refers to spacing between neighboring contacts of different channels and contact balls belonging to the same channel. As the present invention is related to electrode spacing along the length of the array, not across the array, the spacing between contact balls of the same channel is irrelevant to the present invention. The neighboring electrodes spaced along the length of the array are spaced 0.5mm apart and, again, there is no suggestion that these electrodes should be anything other than regularly spaced. There is most certainly no disclosure anywhere within this paper of an electrode array arrangement where electrodes are selectively spaced to have areas of higher or lower electrode density.

Finally, in the rejection regarding the Hochmair Patent (U.S. Patent No. 4,284,856), the Examiner seems to base his argument upon the passage from column 5, line 47 - column 6, line 4. Once again it would appear that the Examiner has taken an interpretation of this passage out of context, and fails to consider the teaching of this patent as a whole. It is well established that the cochlea is tonotopically arranged and as stimulation is applied to the cochlea as one travels apically the frequency response

becomes progressively lower. It is this aspect which forms the basis of all modern stimulation strategies employed in cochlear implants and as such there is nothing new in noting that stimulating different regions within the cochlea will produce percepts of different frequencies. The array shown in Fig. 5 of this document and as discussed in the above referenced passage does not disclose an electrode array having varied densities of electrodes in selected regions. It merely describes an array having four electrodes placed in particular positions through selective frequency response for the corresponding four sound analysis channels of the disclosed device, as is described by the line, "Accordingly, by proper positioning the electrode contacts or balls 92 within the cochlea, the electrical stimulation of the cochlea provided by the prosthetic device will induce a desired frequency response." Once again, there is absolutely no discussion whatsoever about variable spacing of the electrodes.

In order to further differentiate the invention over the prior art, the claims have been amended, as discussed above, to define that the electrodes are distributed to define a non-uniform electrode density at locations related to specific neural areas of the cochlea associated with speech recognition.

It is respectfully submitted that the claims are patentably distinguishable over the prior art of record.

It is respectfully requested that this paper be entered into the record under 37 CFR §1.114(d).

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Respectfully submitted,

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